

TOXICITY OF ASPEN WOOD LEACHATE TO AQUATIC LIFE: LABORATORY STUDIES

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(Received 15 July 1994; Accepted 28 June 1995)

Abstract—Trembling aspen (*Populus tremuloides* Michx.), a common hardwood tree throughout Canada, is being harvested at increasing rates for use in paper and building materials. Piles of aspen logs have been observed to produce a dark, watery, acutely toxic leachate. A laboratory study was undertaken to elucidate the nature, strength, and persistence of aspen leachate toxicity and the chemical composition of the leachate. Leaching from aspen chips in the laboratory was rapid, with 1% mass loss in the first 24 h. Another 2 weeks of immersion was necessary to remove all remaining leachable material (3% total). Fresh aspen leachate derived from a 1:9 wood-water mixture (35 d immersion) was characterized by amber color, low pH (4.0), extremely high BOD (>2,600 mg/L), and high conductivity (1140 μ S/cm). The leachate was rich in phenols (30 mg/L), organic carbon (2,480 mg/L), and organic nitrogen (13 mg/L). Median acutely toxic concentrations of leachate were consistently 1 to 2% of full strength for trout and *Daphnia*. Inhibition of bacterial metabolism began at concentrations below 0.3%. Leachate was less toxic to plant life but inhibited algal growth at concentrations of 12 to 16%. Toxicity of aspen leachate persisted at the same level as in fresh leachate for more than 2 months unless artificial aeration was provided. Persistence was even greater at low temperature (5°C). Aged leachate underwent a transition marked by a rise in pH and dissolved oxygen concentration, a small decline in conductivity, and a color change, from amber to black. Toxicity declined abruptly when the supply of labile toxicants was exhausted, but it sometimes increased again from the products of microbial metabolism. Oxygen depletion, low pH, and phenolic compounds contribute to the toxicity of aspen leachate, but much of the toxic effect must be attributed to other, unidentified constituents.

Keywords—Aspen Toxicity Forestry Phenols Leachate

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